AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions, and listings, of claims in the application:

1-19. (Canceled)

20-41. (**Canceled**)

42. (**New**) A method of configuring a preamble for synchronization and channel estimation in a wireless local area network system, the preamble comprising a first preamble and a second preamble, the method comprising:

a) arranging the first preamble, used for time and frequency synchronization in a receiver, at starting points of an uplink burst and a downlink burst, wherein arranging the first preamble comprises:

arranging, within a data symbol period, 16 S symbols in the starting points of the uplink burst and the downlink burst, and

arranging an IS symbol after the 16 S symbols, wherein the IS symbol has a length of a predetermined guard interval and is 180°-phased with respect to the S symbols; and

b) arranging the second preamble, used for fine frequency offset estimation and channel estimation in the receiver, after the first preamble, wherein arranging the second preamble comprises arranging two L symbols after the first preamble.

43. (**New**) The method of claim 42, wherein a frequency domain signal SP_k of the first preamble is given as the following Equation:

$$SP_k = \begin{cases} \sqrt{200/24} \times \left(C^4_{1,m+1} + jC^4_{8,m+1}\right), k = 16 \times m, 0 \le m \le 6 \\ \sqrt{200/24} \times \left(C^4_{1,m+1} + jC^4_{8,m+1}\right), k = 16 \times (m+1) + 4, 6 \le m \le 11 \\ 0, otherwise \end{cases}$$

where $\sqrt{200/24}$ is a normalized power value resulted from using 12 sub-carriers among 200 sub-carriers, $C^4_{s,m+1}$ is calculated by inverting 0 into -1 in a matrix generated by an m-sequence generator of a fourth-degree polynomial x^4+x+1, and s is an initial value.

44. (**New**) The method of claim 43, wherein a time domain signal of the first preamble is formed by adding the IS symbol to a signal which is an Inverse Fast Fourier Transform (IFFT) processed frequency domain signal SP_k.

45. (**New**) The method of claim 42, wherein the arranging the second preamble comprises arranging a long cyclic prefix (CP) after the first symbol, the long CP has a length of twice the predetermined guard interval, and the L symbols respectively have the length of the data symbol period.

46. (**New**) The method of claim 42, wherein a frequency domain signal LP_k of the second preamble is given as the following Equation:

$$LP_k = \begin{cases} C^8_{1,m+11}, & if \quad k \neq 100 \\ 0, & if \quad k = 100 \end{cases}, \quad 0 \leq k \leq 200$$

where $C^8_{s,m}$ is calculated by inverting 0 into -1 in a matrix generated from an m-sequence generator of an eight-degree polynomial x^8+x^4+x+1, and s denotes an initial value.

47. (**New**) The method of claim 46, wherein the arranging the second preamble comprises arranging a long cyclic prefix (CP) after the first symbol, the long CP has a length of twice the predetermined guard interval, and a time domain signal of the second preamble is formed by repeating a signal twice and inserting the long CP, the signal being formed by IFFT processing the frequency domain signal LP_k.

48. (**New**) The method of claim 42, wherein parameters of the preamble comprise a physical layer convergence protocol preamble (PLCP) period, a cyclic prefix period, a short train sequence period, and a long train sequence period.

49. (**New**) The method of claim 48, wherein, when the preamble is provided in a time domain of a 60 GHz wireless local area network, the PLCP preamble period is set to be 6.8 μs, the cyclic prefix period is set to be 0.133 μs, the short train sequence period is set to be 2.27 μs, and the long train sequence period is set to be 4.53 μs.

50. (**New**) A method of detecting synchronization of data transmitted per frame in a wireless local area network system, wherein the frame comprises a short preamble having a plurality of S symbols and an IS symbol, the method comprising:

a) detecting frame synchronization of the short preamble in a form of a periodically repeated signal according to a characteristic of auto-correlation of the short preamble, wherein the detecting comprises:

i) delaying the short preamble by an auto-correlation delay;

ii) calculating an average value by multiplying a conjugate complex value of the delayed signal by a received signal;

iii) calculating an average value by squaring the delayed signal in i); and

iv) calculating an auto-correlation value based on the average value calculated in ii) and the average value calculated in iii); and

b) estimating timing by performing auto-correlation according to windows having lengths set to have different periods.

51. (**New**) The method of claim 50, wherein in a), amplitude and phase of the window of the auto-correlation are both used for detecting the frame synchronization.

52. (**New**) The method of claim 50, wherein the auto-correlation value $\hat{\tau}_n$ is calculated by the following Equation:

$$\hat{\tau}_n = \frac{\left|\sum_{i=0}^{N_{WS}-1} y_{k-i} y^*_{k-N_{Delay}-i}\right|}{\sum_{i=0}^{N_{WS}-1} \left|y^*_{k-N_{Delay}-i}\right|^2}$$

where y_{k-i} is a received signal, and $y^*_{k-N_{Delay}-i}$ is a signal that is delayed by N_{Delay} samples and is then converted into a conjugate complex.

53. (**New**) The method of claim 52, wherein in ii), the multiplied value is stored in a shift register having a predetermined window length.

54. (**New**) The method of claim 50, wherein in b), the highest peak of auto-correlation is found within a period of the predetermined window length to detect timing.

55. (**New**) The method of claim 50, wherein in b), when a cyclic prefix (CP) is inserted instead of inserting the IS symbol, the length of the window of the autocorrelation is set to be within 16 samples, and a detecting range in the frame synchronization is set to be ±8 samples from a start point of the preamble.

56. (**New**) The method of claim 50, wherein, for confirming the auto-correlation value calculated in iv), a) further comprises:

v) delaying the short preamble by a sum of the auto-correlation delay and a certain confirmation delay;

vi) calculating an average value by multiplying the received signal by a conjugate complex of the delayed signal;

vii) calculating an average value by squaring the delayed signal in v); and

viii) calculating a confirmation-correlation value based on the average value calculated in vi) and the average value calculated in vii) to confirm the auto-correlation value.

57. (**New**) The method of claim 56, wherein the confirmation-correlation value is obtained by the following Equation:

$$\hat{\tau}_{n-confirm} = \frac{\left| \sum_{i=0}^{N_{WS}-1} y_{k-i} y^{*}_{k-N_{Delay}-N_{Confirm}-i} \right|}{\sum_{i=0}^{N_{WS}-1} \left| y^{*}_{k-N_{Delay}-N_{Confirm}-i} \right|^{2}}$$

where $y^{*}_{k-N_{Delay}-N_{Confirm}-i}$ is a signal generated by delaying a received signal by total samples of the auto-correlation delay N_{Delay} and the certain confirmation delay $N_{Confirm}$, and then complex-conjugating the delayed signal.

58. (**New**) The method of claim 57, wherein a starting point of the frame is found by using a window of auto-correlation, the length of the window being set to be N samples, and the highest peak is found within the N samples at a detecting point to increase timing accuracy within ±8 samples.